



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/049,247	06/21/2002	Fritz Steinberg	S04P02US	8352
30008	7590	11/29/2005	EXAMINER	
GUDRUN E. HUCKETT DRAUDT LONSSTR. 53 WUPPERTAL, 42289 GERMANY			HORWAT, JENNIFER A	
			ART UNIT	PAPER NUMBER
			3737	

DATE MAILED: 11/29/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/049,247

Applicant(s)

STEINBERG ET AL.

Examiner

Jennifer Horwat

Art Unit

3737

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 June 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 45-99 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 45-99 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 June 2002 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Preliminary Amendment

2. Acknowledgment is made of the preliminary amendment submitted 1/28/2002 canceling claims 1-44 and submitting new claims 45-99. However, each claim has not been provided with the proper status identifier. The status of every claim must be indicated after its claim number using one of the following identifiers: (Original), (Currently amended), (Canceled), (Previously presented), (New), (Not entered), (Withdrawn), or (Withdrawn-currently amended) in order to be in compliance with 37 CFR 1.121. Please submit a set of properly formatted claims with the response to this action.

Drawings

3. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference character "2" has been used to designate both "Dewar container" on page 12 and "a second-order gradiometer" on page 13 of the specification. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing

sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

4. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: "46" and "P" in figure 7. Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

5. The disclosure is objected to because of the following informalities: on page 13 of the specification the characters [Sch/?] appear on line 14.

Appropriate correction is required.

Claim Interpretation

6. Claims 50, 61, 62, and 84-86 appear to be attempting to invoke 35 U.S.C. 112, sixth paragraph due to the use of means plus functional language.

Claims 50, 62, 85, and 86 do not meet the requirements of the three-prong test due to the recitation of sufficient structure and acts for achieving the specified function. Claim 50 states that the means for operation “comprise a resistor R and an inductive resistor L”, claim 62 states “comprise a mechanism for exact positioning of one or several superconducting objects in the vicinity of at least one of the pickup and bucking coils”, claim 85 states “selected from the group consisting of hydraulic means, mechanical means, and hydraulic-mechanical means”, and claim 86 states “comprise one or several spindle drives”. Therefore, these claims have been interpreted to be limited only by what is in the claim itself.

Claims 61 and 84, however, meet the requirements of the three-prong test and are deemed to be proper usage of means plus function language. Therefore the claims are interpreted to include the limitations as described in the specification and their equivalents. In regards to claim 61 the means for “mechanically compensating (balancing) the gradiometer” is interpreted to be any mechanism for exact positioning

one or several superconducting objects as recited in the specification or the equivalent. In regards to claim 84, the means for “automatically positioning the table” are interpreted to be selected from the group of hydraulic means, mechanical means, and hydraulic-mechanical means.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 45-55 are rejected under 35 U.S.C. 102(b) as being anticipated by Van Duuren, et al (“Frequency readout of relaxation oscillation superconducting quantum interference devices in the GHz regime”, J. Appl. Phys., 1996). Van Duuren discloses a device which is a superconducting quantum interference device (SQUID) based on relaxation oscillations that are induced in a hysteretic dc low-temperature SQUID (page 4164) which has two Josephson junctions which are internally unshunted (figure 1) with a resistor and inductor in series for operating the SQUID in relaxation oscillation mode. The SQUIDS are of the square washer type, with a hole diameter of 13 micrometers and outer dimensions of 50 micrometers with two areal superconducting areas connected to one another by the at least two Josephson junctions, resistor, and inductor (figure 5), resulting in an enclosed area of 1250 square micrometers. The SQUID is operable as part of a multichannel double relaxation oscillation SQUID (DROS)

gradiometer with external wire-wound pickup coils and may be operated in a flux locked loop which give the device practical usability (page 4164).

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claims 56-59, 79, 80, 89, and 90 are rejected under 35 U.S.C. 103(a) as being unpatentable over Van Duuren in view of Ohyu (US 5891031). Van Duuren, as discussed above, discloses the structure and function of the SQUID for operating a SQUID in relaxation oscillation mode, however fails to disclose the configuration of the external wire-wound pickup coils that couple the SQUID to the antenna inductively arranged within a Dewar container. Ohyu discloses a magnetic field measuring apparatus using a multi-channel dc-SQUID fluxometer having different types of pickup coils, including a "plurality of pickup coil units" each "composed of a set of magnetometer type, first-order differential type, and second-order differential type pickup coils" (col 4, lines 18-22). The differential coils are also known as bucking coils and there are three such coils in the second-order gradiometer (figure 4). The coils may have "different base lies" (col 8, line 42) and the pickup coil units are arranged "along a two-dimensional coil arrangement surface curved within a Dewar" (col 8, lines 46-47). The input coils couple the SQUID inductively to the at least one antenna, which is

composed of the pickup coils (figure 7). Additionally, multiple SQUIDs are used, as shown in figure 4, with possibilities ranging from four, as shown, to “three times larger than the number of pickup coil units” (col 4, lines 39-40), which with three pickup units would be nine SQUID circuits. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the disclosure of Van Duuren with the teachings of Ohyu, as Ohyu provides a variety of pickup coils for computing information on magnetic sources in a living body and for compensating for the influence of magnetic crosstalk among the plurality of types of pickup coils.

11. Claims 60-68, 94, 95, and 99 are rejected under 35 U.S.C. 103(a) as being unpatentable over Van Duuren and Ohyu as applied to claims 57 and 58 above, and further in view of Dantsker, et al (US 6154026). Van Duuren and Ohyu, as discussed above, disclose devices for detecting magnetic fields based on a SQUID. For those elements not previously discussed, Ohyu additionally discloses that it is known in the art that bucking coils may consist of any number of windings, exemplarily 1, 2, or 3 (figures 2a, 2b, and 2c) and Van Duuren additionally discloses that the wire used has a diameter of 25 micrometers, which is interpreted to be within the scope of approximately 30 micrometers, as claimed. However, Van Duuren and Ohyu fail to disclose the balancing of the gradiometer and the dimensions of the baseline of the gradiometer. Dantsker discloses a gradiometer for use in making biomagnetic measurements. The gradiometer has a baseline of approximately 5 cm (col 9, line 40), which is a distance “sufficient for useful biomagnetic measurements” (col 11, lines 7-8), but may be in the range of 5-10 cm (col 3, line 19). The gradiometer may “be balanced by any suitable

Art Unit: 3737

method. For example, simple mechanical adjustments may be employed to reposition the inventive flux transformer with respect to the superconducting magnetometer" (col 12, lines 54-58). The pickup coil and bucking coil have diameters of approximately 1.8 cm (figures 3 and 4a) and are comprised of niobium wire (col 2, line 67). Additionally, measurements may be made "without the aid of a magnetically shielded room" (col 13, lines 15-16). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Dantsker to modify the disclosures of Van Duuren and Ohyu as it would be beneficial to be able to use the device outside of a magnetically shielded room and the dimensions of the device are advantageous for use in detecting cardiomagnetic fields, as a "sufficiently long baseline for use in making biomagnetic measurements" is desirable (col 4, lines 45-46).

12. Claim 69 is rejected under 35 U.S.C. 103(a) as being unpatentable over Van Duuren and Ohyu as applied to claim 56 above, and further in view of Cantor (US 5656937). Van Duuren and Ohyu, as discussed above, disclose devices for detecting magnetic fields based on a SQUID, however fail to disclose using approximately 20-40 windings for the input coil. Cantor discloses a similar washer-shaped SQUID for magnetic flux detection. The magnetometer has a thin film spiral superconductor coil with as many as several tens of turns, which acts as an input or transformer coil to inductively couple or transfer signals from the input coil to the underlying SQUID inductance loop" (col 3, lines 31-37). In figures 8a-8g it is seen that the number of windings is varied from 20-50. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the disclosures of Van Duuren and Ohyu with

the teachings of Cantor, as Cantor states this is "essential for operation of the device using conventional flux-locked loop readout electronics" (col 3) as is disclosed by Van Duuren for operation of the device.

13. Claims 70 and 71 are rejected under 35 U.S.C. 103(a) as being unpatentable over Van Duuren and Ohyu as applied to claim 56 above, and further in view of Ghoshal, et al (US 6118284). Van Duuren and Ohyu, as discussed above, fail to disclose a lens for bundling the magnetic field lines. Ghoshal teaches that thin film flux-concentrators made of magnetic NiFe may be used to focus the net magnetic field onto the sensor (col 10, lines 48-53). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the disclosures of Van Duuren and Ohyu with the teachings of Ghoshal in order to increase the sensitivity of the device.

14. Claims 72-77 are rejected under 35 U.S.C. 103(a) as being unpatentable over Van Duuren in view of Wikswo, Jr., et al (US 3980076). Van Duuren, as discussed above, fails to disclose the details of a Dewar container within which the SQUID may be arranged. Wikswo discloses a Dewar container which contains the magnetometer (col 9, lines 56-57) which is mounted in the super-insulated helium Dewar in "such a manner that the lower coil of the flux transformer can be brought within one inch of an accessible external point" (col 9, lines 57-60). The "spacing of the Dewar walls" must be such that "the magnetometer coil can be placed close to the chest of the patient" (col 9, lines 65-67). The Dewar has "a plurality of layers of perforated aluminized Mylar act[ing] as radiation shields between the gas-cooled shields and the Dewar walls" (col 10, lines 19-22) on the sides of the Dewar with except the area at the bottom

underneath the pickup coil (figure 10b). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the disclosure of Van Duuren with the disclosure of Wikswo, as the SQUID must be contained in such a container for practical use in an operating room as the Dewar container provides the cooling medium to keep the SQUID operational.

15. Claim 78 is rejected under 35 U.S.C. 103(a) as being unpatentable over Van Duuren and Wikswo as applied to claim 72 above, and further in view of Podney (US 5845500). Van Duuren and Wikswo, as discussed above, disclose a SQUID magnetometer device that consists of a Dewar container for maintaining appropriate temperature, however fail to disclose the volume of cooling medium used. A variety of Dewar containers of various shapes and sizes are known in the art. Podney discloses a Dewar container that holds preferably 7.7 liters of cooling medium (col 12, lines 31-34). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the device disclosed by Van Duuren and Wikswo, as Podney states using this smaller volume, as compared to much larger volumes allows for a "compact dewar" (col 12, line 32), which allows the overall size of the device to be smaller.

16. Claims 81-87 are rejected under 35 U.S.C. 103(a) as being unpatentable over Van Duuren in view of Tamura, et al (US 5617856). Van Duuren, as discussed above, discloses the SQUID device having at least one pickup coil for functioning as a magnetometer, however fails to disclose a positionable patient support for use with the device. Tamura discloses a patient support that is operable with a biomagnetic field measuring apparatus. The "supporting means used is mainly made of a non-metallic,

non-magnetic material such as fiber-reinforced plastic" (col 6, lines 43-45). A guiding rail is provided so that the "position of the lying section may be moved along the guiding protrusion of the guiding rail" (col 11, lines 44-47) and a pulley is provided which is operated by rotating an operating rod with a handle, which is interpreted to be a type of rotational motor, or spindle drive. This allows "the body of the subject lying on the bed may be moved up and down by the movement of the bed to align the position of the brain or other part of the subject to be measured for a magnetic field, with the magnetic field-measuring means. Hence, there is no need to move the magnetic field-measuring means" (col 12, lines 7-13). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the disclosure of Van Duuren with the patient support of Tamura, as the magnetic field devices are very sensitive to motion and should remain fixed while in use, however it is advantageous to be able to move the patient relative to the device for better alignment and positioning.

17. Claims 88, 91-93, and 96-98 are rejected under 35 U.S.C. 103(a) as being unpatentable over Van Duuren in view of Machida, et al (US 6473518). Van Duuren, as discussed above, and for those elements not previously discussed additionally discloses the use of a flux locked loop operation with a test flux "added to the feedback flux to test the flux locking or to measure open loop characteristics" (page 4171) with no flux modulation applied. However, van Duuren fails to explicitly disclose methods for automatically considering disturbances that are recorded. Machida teaches that the output voltage is input to a flux locked loop circuit which cancels changes in the biomagnetic fields into the SQUID by means of a feedback coil (col 4, lines 56-60) and

thus the noise is automatically cancelled out at the occurrence of the disturbance.

When the object is to be examined, it is moved into position and the absolute position of the pickup coils are not changed (col 15, line 66 – col 16, line 24). Machida discloses measuring cardiomagnetic fields at 64 points of a rectangular grid at 2.5 cm spacing (col 15). At the time the invention was made, it would have been an obvious matter of design choice to a person of ordinary skill in the art to measure on 36 points at 4 cm spacing, as it has not been disclosed that this configuration provides an advantage, is used for a particular purpose, or solves a stated problem. One of ordinary skill in the art, furthermore, would have expected the invention to perform equally well with either field-measuring configuration because both configurations reasonably sample the target area, namely the area over the heart for measuring cardiomagnetic fields. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the disclosure of Van Duuren with the teachings of Machida, as it is desirable to reduce the presence of noise as much as possible with SQUID devices in order to obtain the best possible readings.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer Horwat whose telephone number is (571) 272-2811. The examiner can normally be reached on M-F 8-4:30.

Art Unit: 3737

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Brian Casler can be reached on (571) 272-4956. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

jah
11/23/05

Brian Casler
Bmcl
SPB 3737